



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/199,816	11/25/1998	MASATO SHIMADA	Q52241	4106

7590 04/27/2005  
SUGHRUE, MION, ZINN, MACPEAK & SEAS  
2100 PENNSYLVANIA AVENUE NW  
WASHINGTON, DC 200373202

EXAMINER

NGUYEN, LAM S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 04/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/199,816

Applicant(s)

SHIMADA ET AL.

Examiner

LAM S. NGUYEN

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02/11/05 (RCE and Response).
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3, 10-12, 20-23, 36, 38, 40-42, 48, 51, 52 and 67 is/are pending in the application.
- 4a) Of the above claim(s) 4-9, 13-19, 24-35, 37, 39, 43-47, 49, 50 and 53-66 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 10-12, 20-23, 36, 38, 40-42, 48, 51, 52 and 67 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 January 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 02/11/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

The indicated allowability of claim 48 is withdrawn in view of the reconsideration of the teaching of the cited prior art. Rejections based on the newly cited reference(s) follow.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 40-42 recite the limitation "the elastic film". There is insufficient antecedent basis for this limitation in the claim.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-3, 10, 20-22, 36, 40-42, 48, 51-52/1-3, 51-52/10, 51-52/48, and 67 are rejected under 35 U.S.C. 102(b) as being anticipated by Hashizumi et al. (EP 786,345).

#### **Regarding claim 1:**

Hashizumi et al. disclose in an ink jet recording head of the type having  
a flow passage formation substrate (*FIG. 12, 15, element SI*) in which a pressure generation chamber is formed (*FIG. 12, 15, element IT*), said pressure generation chamber being in communication with a nozzle opening (*FIG. 12, 15, element NH*),  
a diaphragm (*FIG. 12, 15, elements BE, VP*) provided on said flow passage

Art Unit: 2853

formation substrate, said diaphragm defining an interior wall of said pressure generation chamber, and

a piezoelectric element (*FIG. 12, 15, elements UE, PZ, BE*) provided on said diaphragm, said piezoelectric element having at least a lower electrode (*FIG. 12, 15, element BE*), a piezoelectric layer (*FIG. 12, 15, element PZ*), and an upper electrode (*FIG. 12, 15, element UE*), the improvement comprising:

at least one of the group consisting of said diaphragm and said piezoelectric element, includes a compression film having a compressive stress (*column 10, lines 7, 8: The layer VP has a compressive internal stress*), wherein at least a part of a thickness of said compression film is removed in an area opposed to said pressure generation chamber, thereby forming a removal part (*Fig. 15: The portion td2, FIG. 12: The portion ta2, and column 3, lines 5-10: The portion of the diaphragm in the area not attached to the piezoelectric thin film is thinner than the portion of the diaphragm in the area attached to the piezoelectric thin film*) (**Regarding claims 40-42**) (*Note: the rejection of claims 40-42 is made with assumption that the elastic film is part of the compression film or versa*).

**Regarding to claim 2:** wherein the compression film is other than the piezoelectric layer (*FIG. 12, 15: Only either layer BE or VP, not layer PZ, has the compressive stress*).

**Regarding to claim 3:** wherein the compression film has at least a part in the thickness direction removed only in a portion along margins of the pressure generation chamber on both sides of said piezoelectric element in a width direction thereof (*FIG. 15: The portions ta2, td2*).

**Regarding to claim 10:** wherein the compression film forms at least a part of an elastic film forming at least a part of the diaphragm (*Fig. 15 and column 10, lines 5-10: The silicon oxide film VP is one of diaphragm materials*).

**Regarding to claims 20-22, 36:** wherein the lower electrode is made of the compression film, wherein the lower electrode is made of a metal material, wherein the lower electrode is made of metal oxide, wherein the metal material is selected from platinum, palladium, iridium, rhodium, osmium, ruthenium, and rhenium, and compounds thereof. (*column 9, lines 25-35: The diaphragm VE also serving as another electrode is made by Pt*).

**Regarding to claim 48:** wherein a stress of the piezoelectric layer when a drive force load is imposed on said piezoelectric element is equal to a stress at the piezoelectric layer formation time or is larger in a tension direction (*FIG. 15: The load on the piezoelectric layer must be greater than a tensile stress in order to allow the layer is deformed*).

**Regarding to claim 51/1-3,10,20-22,36,40-42,48:** wherein the pressure generation chambers are formed on a silicon monocrystalline substrate by anisotropic etching (*col. 12, lines 40-46 and column 7, line 57 to column 8, line 5*) and the layers of said piezoelectric element are formed by film forming and lithography process (*column 1, line 57 to column 2, line 5*). (*In addition, because these claims are apparatus claims, the limitations that claim the method for forming the pressure generation chambers on the substrate and the layers of the piezoelectric element are considered but not given patentable weight*).

**Regarding to claims 52/1-3,10, 20-22,36,40-42,48:** An ink jet recorder comprising an ink jet recording head as claimed in claims 1-3, 10, 48 (*column 1, lines 4-10*).

**Regarding to claim 67:** wherein said compression film includes said compressive stress pre-established therein (*column 10, lines 76-10: The layer VP has a compressive internal (pre-established) stress*).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 11-12, 51/11-12, 52/11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hashizumi et al. (EP 786,345) in view of Ichikawa (US 6022458).

Hashizumi discloses the claimed invention as discussed above and wherein the elastic film is made of the compression film only (*Fig. 15 and column 10, lines 5-10: The silicon oxide film VP is one of diaphragm materials which is elastic*). However, even though Hashizumi teaches that the compression film is made of a monocrystalline substance, but is silent whether the residue of the compression film forming a part of the elastic film is made of a polycrystalline substance.

Ichikawa suggests that during a film producing process, a polycrystalline substance layer enables to form a denser film than a monocrystalline substance layer (*column 6, line 58 to column 7, lines 4*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the compression film disclosed by Hashizumi such as using polycrystalline substance instead of monocrystalline substance as suggested by Ichikawa. The

Art Unit: 2853

motivation for doing so would have been to enable formation of a dense film as taught by Ichkawa (*column 6, line 58 to column 7, lines 4*).

3. Claims 23, 38, 51/23, 51/38, 52/23, 52/38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hashizumi et al. (EP 786,345) in view of Yokoyama et al. (US 5831299).

Hashizumi discloses the claimed invention as discussed above except wherein the lower electrode is made of metal nitride that is selected from titanium nitride, niobium nitride, zirconium nitride, tungsten nitride, hafnium nitride, molybdenum nitride, tantalum nitride, chromium nitride, and palladium nitride, and compounds thereof.

Yokoyama et al. discloses an thin ferroelectric film element comprising lower and upper electrodes, wherein the lower electrode includes a monolayer film of a high melting-point metal such as Ta, Ti, W or a nitride thereof (*column 5, lines 5-12*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the lower electrode disclosed by Hashizumi so the electrode is made of a metal nitride such as a nitride of Ti as suggested by Yokoyama et al.. The motivation for doing so would have been to obtain a high melting-point electrode as taught by Yokoyama et al. (*column 5, lines 5-12*).

### ***Response to Arguments***

Applicant's arguments filed 02/11/2005 regarding to the election/restriction have been found persuasive. As a result, claims 11-12, 20-23, 36, 38, and 40-43 are included for further prosecution. The rejection of the claims is made as above.

Applicant's arguments filed 02/11/2005 regarding to the claim rejections have been fully considered but they are not persuasive.

The applicants argued that the layers VP in FIGs. 15 and 12 are not necessarily made to exactly the same process, they do not necessarily include the same properties. As an evidence, the applicants stated that the “steps” as described with reference to Figs. 16-26 are very general in nature and include a considerable amount of variability. However, as stated in MPEP 2145 I that “An assertion of what seems to follow from common experience is just attorney argument statements and not the kind of factual evidence that is required to rebut a prima facie case of obviousness”, the above applicants’ argument is not a factual evidence to show that the VP layers in FIG. 12 and FIG. 15 can not be made by the same process. As a result, as based on the teaching on column 16, lines 20-25 that the layer VP in FIG. 15 and the layer VP in FIG. 12 are formed by the same process (FIG. 16-26), made of the same material, silicon oxide, and on the same substrate Si, they must have the same characteristic properties. So if the applicants admit that the diaphragm VP in FIG. 12 has an internal compression stress, the layer VP in FIG. 15 must have an internal compression stress too.

In addition, the applicants bases on the difference in the BE layers of the Fig. 12 and FIG. 15 embodiments to conclude that the embodiments of Figs. 12 and 15 are not made by the same process. The examiner responses that the difference in forming the BE layer of the two embodiments does not necessary differ the processes of forming the VP layers in two embodiments. In contract, as clearly stated in column 16, lines 20-25, the layer VP in FIG. 15 and the layer VP in FIG. 12 are taught to be formed by the same process (FIG. 16-26).

Moreover, as based on the definition that compressive stress is an internal resistance, or counterforce, of a material to the distorting effects of an external force or load to the material resulting in their compaction (See the following cited references: **Stress-Strength (Mechanics)**)



Art Unit: 2853

**of Materials and Compressive Stress**), the VP layer in Fig. 15 embodiment must have a compressive stress in order to allow the VP layer turn/compact back to the original formation after distorted/bended by an external force from the piezoelectric element.


***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LN  
August 3, 2004

  
**HAI PHAM**  
**PRIMARY EXAMINER**